

The variable prosodic parsings of Nivaêle glottal stop

ABSTRACT SUMMARY:

This paper establishes the featural and prosodic representations of the Nivaêle (Mataguayan) glottal stop. On the one hand, it is proposed that the Nivaêle glottal stop is unspecified for place features, but specified for constricted glottis ([c.g]). On the other hand, it is advanced that /ʔ/ is an independent consonantal phoneme in the language that has multiple prosodic parsings. First, a glottal stop can occur (contrastively) in syllable onset position. Second, a postvocalic glottal stop can be variably parsed to the vocalic Nucleus of the syllable and hence form part of a Complex Nucleus or to the coda position. As a result, two different manifestations of phonetic glottalized vowels are realized: *creaky/rearticulated* and *vowel-glottal coda*, respectively. It is argued that these diverse glottal realizations are rooted in a set of prosodic constraints.

KEYWORDS: Nivaêle, phonology, glottal, features, prosody.

RESUMEN:

Este trabajo establece la configuración de rasgos distintivos y las representaciones prosódicas de la oclusiva glotal del Nivaêle (mataguaya). Por un lado, se postula que la oclusiva glotal del nivaêle no está especificada para rasgos de lugar, sí para rasgos de glotis constreñida ([g.c.]). Por otro lado, se propone que la /ʔ/ es un fonema consonántico independiente que tiene varios análisis prosódicos. Primero, una glotal puede ocurrir (de manera contrastiva) en posición silábica de ataque. Segundo, una glotal postvocálica, puede ser variablemente analizada como Núcleo de la sílaba, y así formar parte de un Núcleo Complejo, o como coda. Por lo tanto, aparecen dos realizaciones fonéticas de vocales glotalizadas: vocales *rechinadas/rearticuladas* y *vocal-glotal* en posición de coda, respectivamente. Estas diversas realizaciones de la glotal están basadas en una serie de restricciones prosódicas.

PALABRAS CLAVE: nivaêle, fonología, glottal, rasgos, prosodia.

1. Introduction

The featural representation and phonemic status of the glottal stop, its surface realizations, and glottalization on vowels, have raised challenges in the phonological analyses of languages of the Americas (Silverman 1997, Gerfen & Baker 2005, Stenzel 2007, Elías-Ulloa 2009, Chávez-Peón 2010, Bennett & Henderson 2013, Arellanes Arellanes 2015, Avelino, Coler & Wetzels 2015, among others).

Most of the problems posed by the glottal stop arise from its ambiguous patterning. On the one hand, the glottal stop can form a natural class with either obstruents or sonorants. On the other hand, what is commonly referred to in phonological inventories as “glottal stop” has been variously analyzed as: i) a full

independent segment (e.g., Yalálag Zapotec, cf. Avelino 2004); ii) a constricted glottis ([c.g.]) feature on vowels (e.g. Mixtec, cf. Gerfen 1999); iii) a floating constricted glottis feature (e.g., Mixtec, cf. Macaulay & Salmons 1995), and as a floating tone (Tukano, cf. Ramírez 1997 as cited in Stenzel 2007). Furthermore, unlike other features, which are posited to have a unique structural dominance affiliation within a given feature hierarchy model, the [c.g.] feature has been variously analyzed as directly dominated by a mora in Wanano (Stenzel 2007), exclusively by a non-nuclear mora in Blackfoot (Peterson 2004), by a root node (Zoll 1996), or a laryngeal ([LAR]) node (Clements & Hume 1995).

The phenomenon of glottalization has been proposed as a possible areal feature of Chaco languages (González 2014).¹ The Mataguayan language family (Chorote, Maká, Nivaê, and Wichí) belongs to this group.² While there is consensus about the presence of ejective obstruents and glottal stops in Mataguayan languages (Chorote, Maká, Nivaê, and Wichí), the relationship between glottal stops and vowels in these languages has not been exhaustively or comparatively studied. Nevertheless, what is consistent in the previous literature is the analysis of the glottal stop as an independent phonemic segment: Gerzenstein (1983) and Carol (2014) for Chorote, Gerzenstein (1994) for Maká, Stell (1972, 1989) and Gutiérrez (2015, 2016) for Nivaê, and Nercesian (2014) for Wichí.

This paper establishes the featural and prosodic representations of the Nivaê glottal stop. On the one hand, it is proposed that the Nivaê glottal stop is unspecified

¹ Demolin & Storto (2012: 268-269) point out that glottalized obstruents and sonorants are found “in a good number of South American languages, though less common in Amazonia.” According to the authors’ survey, glottalized consonants can be found in Atacameño, Aymaran, Chonan, Selk’nam, Tehuelche, Itonama, Kawesqar, Matacoan [Mataguayan], Nambiquaran, (many dialects of) Quechuan, Trumai, Uru-Chipayan, and Vilela.

² In the literature on this language family, other names have been alternatively used: Matacoan or Mataco (Greenberg 1987:73, Campbell & Grondona 2007), Mataco-Mataguayan (Tovar 1961), Mataco-Maka (Kaufman 1990:46), and Mataguayan (Najlis 1984, Fabre 2014).

for place features, but specified for constricted glottis ([c.g.]). On the other hand, it is advanced that /ʔ/ is an independent consonantal phoneme in the language that has variable prosodic parsings. First, a glottal stop can occur (contrastively) in syllable onset position. Second, a postvocalic glottal stop can be variably parsed to the vocalic Nucleus of the syllable and hence form part of a Complex Nucleus or to the coda position. As a result, two different manifestations of phonetic glottalized vowels are realized: *creaky/rearticulated* and *vowel-glottal coda*, respectively. It is argued that these diverse glottal realizations are rooted in a set of prosodic constraints.

This paper is organized as follows. Section 2 gives background on the Nivaê language and on the ambiguous phonological patterning of glottal stops across languages. Section 3 analyzes the interplay between the Nivaê glottal stop and syllable structure constraints. It is shown that this segment can be parsed not only to onset and coda positions, but also to the Nucleus of the syllable. Section 4 postulates the featural representation of the glottal stop and presents a number of arguments for its placeless specification. Finally, Section 5 concludes with the main findings of this chapter.

2. CONTEXT

2.1 The language and its speakers

Nivaê [niβa'kle] is a Mataguayan language spoken in the Argentinean and Paraguayan Chaco by approximately 16,350 speakers in Paraguay (DGEEC 2012) and 500 in Argentina (INDEC 2004-2005). The Nivaê language has also been referred to in the literature as *Ashlushlay* (Henry 1936; Wicke & Chase-Sardi 1969, Stell 1972) *Chunupí* (Hunt 1915) and *Chulupí* (Junker et al. 1968; Stell 1989; Campbell & Grondona 2007). Nivaê is the preferred name in Paraguay. Here I adopt the spelling Nivaê, rather than Nivaclé, Nivakle, or Niwakle, following the new

orthographic conventions established during the 2nd. Nivaêle Linguistic Congress (*Uj'e Lhavos*, Paraguay, December 3-5 2010).³

2.2 The Nivaêle phonological system and the data

Nivaêle has 21 phonemic consonants, presented in Table 1. Similarly to other Mataguayan languages, Nivaêle has a two-way laryngeal distinction in non-continuant obstruents (plain vs. ejectives) – except for the complex segment $[\overline{kl}]$ – and no voicing contrast (voice vs. voiceless) within the obstruent class. Fricatives contrast in four places, and there is a lateral fricative. Segments in square brackets represent allophonic variants of the segments to their left, while variation is indicated by the tilde (~) symbol.

Table 1. Nivaêle consonants

		Labial	Dent-alv.	Palato-alv.	Palatal	Velar	Uvular	Glottal
Stop	Plain	p	t			k	~ [q]	
	Ejective	p'	t'			k'	~ [q']	ʔ
	Lateral release					\overline{kl}	~ [ql]	
Affricate	Plain		\overline{ts}	$\overline{tʃ}$				
	Ejective		$\overline{ts'}$	$\overline{tʃ'}$				
Fricative		f ~ [ɸ]	s	ʃ ʈ		x	~ [χ]	~ [h]
Nasal		m	n					
Approximants		w ~ [β]			j			

Regarding the Nivaêle vowels, while Stell (1989:97) postulates a phonemic distinction between plain vowels /i e a ɑ o u/ and glottalized vowels /i̥ e̥ ḁ o̥ u̥/, Gutiérrez (2015) argues that there are only six vowels /i e a ɑ o u/, and that glottalized vowels are underlying vowel-glottal stop /Vʔ/ sequences with different prosodic parsings (cf. Section 3.3).

³ During that congress, the Linguistic Committee of the Nivaêle People (*Comisión Lingüística Pueblo Nivaêle*, CLPN) was created. One of the goals of the CLPN, formed by Nivaêle teachers and specialists on the Nivaêle language and culture, was to revise and consolidate the two Nivaêle orthographies constructed by distinct religious missions: one proposed by the Catholics and one proposed by the Mennonites. In the Paraguayan Chaco, Nivaêle writing and reading skills are taught until the sixth grade of primary school.

The Nivaê data discussed here are from my own fieldwork with both female and male native speakers of Nivaê. Fieldwork was carried out in the Nivaê communities of *Uj'e Lhavos* and Santa Teresita (Paraguay) between 2009 and 2013.

2.3 On the ambiguous patterning of glottal stop

Cross-linguistically, glottal stops often pattern differently from supralaryngeal consonants. This asymmetry has been mostly characterized in terms of different featural configurations, namely, that glottals are placeless or do not have an oral articulator (Steriade 1987, Bessell & Czaykowska-Higgins 1991, Buckley 1994, Rose 1996). Some phonological patterns particular to the glottal stop are laryngeal transparency to the spreading of vocalic place features (1a) or nasalization (1b); debuccalization of final stops and fricatives (2); and epenthesis/hiatus-resolution processes (3) (see also Shaw (1991) and Borroff (2007)).

(1) Arbore (Cushitic)

a. /gereʔa/ [gereʔe] ‘it is a belly’ (Steriade 1987)

Sundanese (Austronesian)

b. /niʔis/ [niʔĩs] ‘relax in a cool place’ (Cohn 1993)

(2) Kelantan (Austronesian)

a. /ʔasap/ [ʔasaʔ] ‘smoke’ (Trigo 1991:124)

b. /kilat/ [kilaʔ] ‘lightening’

c. /balas/ [balah] ‘finish’

(3) Malay (Austronesian)

a. /di-daki/ [didaki] ‘to climb [PASS]’ (Lombardi 2002: 228)

b. /di-ukir/ [diʔuke] ‘to carve [PASS]’

In some cases, glottal stops have been treated as a type of pharyngeal (McCarthy 1991). Following McCarthy (1994), Lombardi (2002:221) adopts the hypothesis that glottal stops have pharyngeal place and extends the Place Markedness

hierarchy (Prince & Smolensky 1993) by adding PHARYNGEAL as the least marked place: *DOR, *LAB » *COR » *PHAR. This representation would then, according to Lombardi, account for the unmarked status of the glottal stop and its role in the aforementioned phenomena of transparency, neutralization and epenthesis.

Another facet of the complex status of glottal stops is that they have been analyzed variously as (i) segmental or (ii) suprasegmental phenomena. When considered full segments, glottals have been treated as obstruents (Ladefoged 1971, Hyman 1975) or sonorants (Chomsky & Halle 1968) and so patterning with glides (Kenstowicz & Kisseberth 1979, Kavitskaya 2002). In addition, there has been debate as to whether glottal stops are [+ consonantal] (Hyman 1985) or not (Hume & Odden 1996).

Two other kinds of patterns have led to the analysis of glottals as suprasegmentals: specifically, glottal stops may be implemented as creaky phonation overlaid on the realization of other segments, and underlying creaky phonation may be realized as glottal stop (Avelino 2004:181). For instance, whereas the glottal stop of Yatzachi Zapotec is sometimes realized as creakiness on the surface (as a prosodically conditioned variant realization), other related languages – Jalapa Mazatec, Comaltepec, Chinantec and Copala Trique – simply have phonemic creakiness (Borroff 2007:39). In other words, there is not a necessary one-to-one correspondence between phonemic representations and phonetic reality.

3. Nivaêle glottal stop and syllable structure

In the literature on glottalized vowels in other languages, most of the arguments against treating the glottal stop as a phonemic segment rely on its defective distribution, e.g., the glottal stop may be the only coda in a language, (e.g. in Mixtec; Macaulay & Salmons 1995), and/or the glottal stop may not occur or be contrastive in

initial position (e.g. in Quiavini Zapotec; Chávez-Peón 2010). As will be shown in the following sections, the Nivaêle glottal does not fit this picture; [ʔ] is contrastive in onset position (cf. Section 3.2) and I will argue that, importantly, it can be also parsed to coda position (cf. Section 3.3).

3.1 Nivaêle glottal stop as an epenthetic onset

An initial question related to the interplay of syllable structure constraints and the role of epenthetic glottal stop is whether onsetless syllables ever occur in Nivaêle. Stell (1989:116-117) claims that V syllables are licit syllable structures in Nivaêle; she illustrates her point through the following examples:⁴

- (4) o-sej-k̄l̄a
‘prickly pear’

- (5) ʎa-n-ku-a
3.S-DIR-desire-3.O
‘he desires (s.t.)’

Stell (1989:116-117)

Based on the data gathered in the context of my own fieldwork, I will argue that onsetless syllables are neither allowed at the beginning, nor inside of the word; the constraint ONSET is undominated (8).

- (6) [ʔ]osej-k̄l̄a
‘prickly pear’

- (7) ʎan-kú = [ʔ]a
3.S-desire = 3.O
‘he desires (s.t.)’

⁴ Abbreviations used in this paper include: 1: first person, 2: second person, 3: third person, BEN: benefactive, CISL: cislocative, CON: container, DET: determiner, DIR: directional, EXCL: exclusive, IMP: imperative, INST: instrumental, INT: intransitivizer, IPFV: imperfective, IT: itive, LOC: locative, NEG: negation, O: object, PL: plural, POSS: possessive, PUNCT: punctual, S: subject, VEN: ventive. Note that transcriptions follow IPA conventions, but primary stress will be represented with an acute accent and secondary stress with a grave accent.

(8) ONSET » DEP-IO-ʔ

(9)

/osejk̩la/	ONSET	DEP-IO-ʔ
a. osejk̩la	*!	
b. ʔosejk̩la		*

In (9) it can be seen that an epenthetic glottal stop is inserted to ensure satisfaction of ONSET, thus violating low-ranked DEP-IO-ʔ.

In her grammar, Stell (1989) presents three allomorphs for the first person possessive prefix:

Table 2. First person plural inclusive possessive prefixes

kas-	before CV-initial roots
kats̩-	before V-initial roots
kats̩i-	before CC-initial roots

Here I argue that because [kats̩-] – not [kas-] – is prefixed to the root in cases like (10b), there is no underlying glottal stop in root initial position:

- (10)
- a. [ʔ]a.si.nú
speech-BEN
‘word/speech’
- b. ka.ts̩-àsi.nú
1.POSS-speech
‘our speech’
- c. *kas-ʔasi.na
1.POSS-speech
‘our speech’

Also, Stell notes a series of allomorphic alternations involving glottal stops. There exist a number of suffixes that alternate between being vowel-initial and [ʔ]-initial, as seen in the (d)-(e) and (f)-(g) pairs in (11), as well as parallel alternations between the vowel-final and [ʔ]-final prefixes, as in the (a)-(b) pairs. Rather than

treating such cases as *allomorphic* alternations, I treat them as *phonologically-governed* alternations. For example, if the root for ‘love’ is posited to be V-initial, /en/, rather than glottal-initial, then the surface occurrence of [ʔ], and the /x-/ form of the first person subject follow as *phonological* generalizations.

(11) **Morpheme boundary epenthetic onset**

- | | | |
|--|--|-------------------------------------|
| a. ni-n-fós
NEG-3.S-bury
‘s/he does not not bury’ | b. ni-[ʔ]én
NEG-love
‘you do not love’ | cf. c. x-én
1.S-love
‘I love’ |
| d. ni-j-én-eł
NEG-1.S-love-EXCL.PL
‘we do not love’ | e. x-a.tsí-[ʔ]eł
1.S-pour-EXCL.PL
‘we pour’ | Stell (1989:258) |
| f. xà-t-pekl-éj
1.S-CISL-return-DIR
‘I return to...’ | g. xa-pèʔ-ja-[ʔ]éj
1.S-hear-PUNCT-DIR
‘I hear (from the distance)’ | |

What is seen here is that vowel sequences that arise through morpheme concatenation are systematically avoided by epenthesis of a glottal stop. From the perspective of syllabification of the segmental sequence, this [ʔ] functions to provide an onset for the otherwise onsetless vowel-initial syllable. To illustrate this, consider the syllabification of the form for ‘you do not love’ in (11b) with – as opposed to without – the epenthetic [ʔ]:

(12)



What has been argued in this section is that there are a diversity of morphophonemic alternations in Nivačle that receive a more systematic interpretation

within an analysis that recognizes a role for epenthetic glottal stop. There are two basic contexts in which [ʔ] can be epenthesized to repair ill-formed surface sequences. One is to provide an ONSET to all otherwise V-initial words. The other is to avoid a word-internal sequence of two vowels in a row, *VV, as in (12b).

The further question then is what kind of evidence can be adduced for whether a surface [ʔ] in either of these contexts is underlying. This is addressed in the next section.

3.2 Non-epenthetic glottal stop onset

Non-epenthetic glottal stop can occur clitic/suffix-initially (13a), (14), and (15). A crucial piece of evidence for the phonemic status of glottal stop in onset position is the contrast between the second person object /ʔa/ (13a) and the third person object /a/ (13b):

- (13) a. k'-uʔ-éʃ = ʔa
 1.S-believe-INST = 2.O
 'I believe in you'
- b. k'-uʔ-éʃ = a pa = fítsak'ajitʃ
 1.S-believe-INST = 3.O DET = God
 'I believe in God'

Other grammatical suffixes such as the locative [-ʔe] and the imperfective [-ʔin] consist of a lexically specified glottal stop before the vowel. In contrast with the directional /-ej/ in (11d, f), when these suffixes get attached to a consonant-final root, the glottal stop of the locative [-ʔe] and the imperfective [-ʔin] is parsed into onset position.

- (14) [t'a-kúm-ʔin] a'. *t'a.ku.min
 /t'a-kuʔm-ʔin/
 3.S-work-IPFV
 'He is working'

- (15) a. $\text{kla.t}\bar{\text{s}}'\text{ús-}\text{ʔe}$ a'. * $\text{kla.t}\bar{\text{s}}'\text{u.s-e}$
 slippery-LOC
 b. $\text{nake x-an-}\text{ʔé}$ $\text{na}\beta\text{a}=\text{ji-t}\bar{\text{a}}\text{s.xe-}\text{ʃi.j-}[\text{í}]\text{s}$ b'. * xane
 here 1.S-put-LOC DET.PL = 1.POSS-eye-CON-PL
 'I put my glasses here'

cf. (11d,f) repeated here for convenience:

- (16) a. $\text{ni-j-én-e}\text{ł}$
 NEG-1.S-love-EXCL.PL
 'we do not love' (Stell 1989:258)
 b. $\text{xà-t-pe.k}\bar{\text{l}}\text{-éj}$ $\text{na}=\textit{Filadelfia}$
 1.S-CISL-return-DIR DET = *Filadelfia*
 'I return to Filadelfia'

As seen in Figure 1 below, the presence of the suffix-initial [ʔ] from the example in (14) shows clearly in the waveform as aperiodicity and low amplitude in the signal.

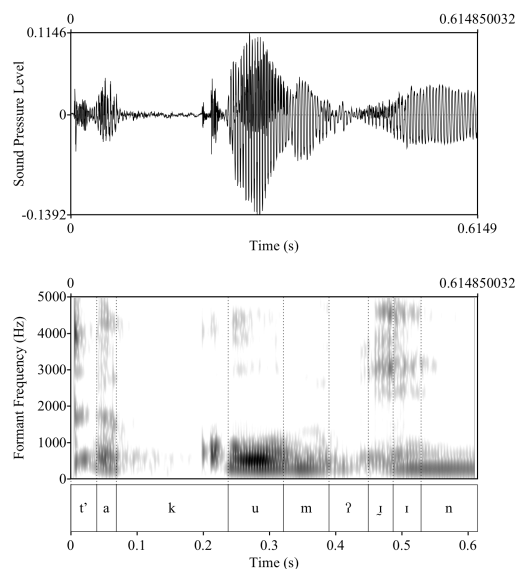


Figure 1. Waveform and spectrogram [t'akúmʔin] 's/he works' by female speaker TS.

During fast speech, the ʔ-initial suffix overlaps with the articulation of a preceding non-continuant obstruent, e.g., a root-final stop, such that an ejective stop results:

- (17) ji-ʔé na = kots.xát-ʔe ~ kots.xá.t'e
 be-LOC DET = land-LOC
 'It is on the land'

Below, Figures 2 and 3 show the alternation between the forms in (17).

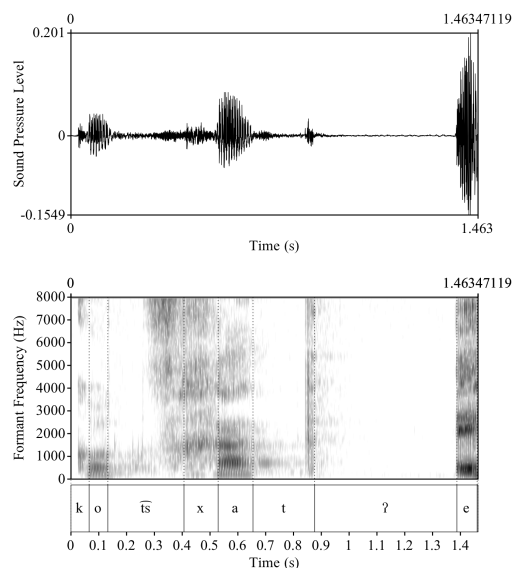


Figure 2. Waveform and spectrogram [kotsxátʔe] 'on the land' by male speaker FR.

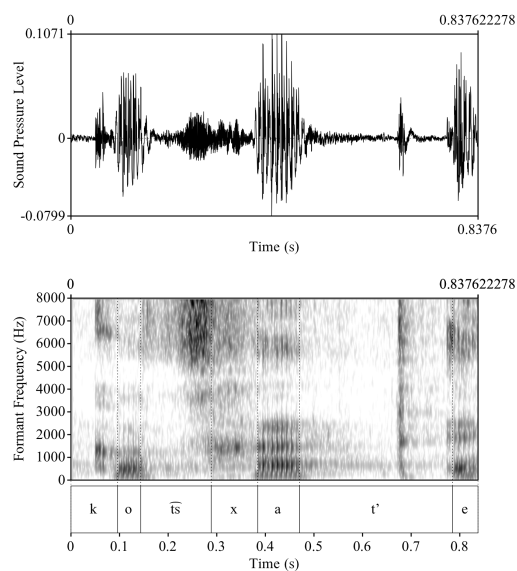


Figure 3. Waveform and spectrogram [kotsxát'e] 'on the land' by male speaker FR.

Note the long glottal stop closure in Figure 3; this is characteristically found in a very emphasized stop-glottal sequence in a citation context. In this first version, FR emphasized the presence of a glottal stop in a very careful pronunciation of 'on the

land'. The second version (Figure 3) is characteristic of casual speech. The important point here is that the glottalization that is realized as either [tʔ] or [tʰ] can only result from there being a phonemic /ʔ/ in the input; [kots̃.xa.te] is not attested as a possible output. The alternative hypothesis that the root-final consonant is an ejective stop /kots̃xaʔt/ is not plausible as it would not account for the [...tʔ...] realization. Nor would it account for the fact that in other contexts when an epenthetic vowel is inserted, as shown in (18), there is no ejective in the output.

- (18) a. kots̃xat-[í]s
land-PL
'lands'
b. *kots̃xat'-[í]s

Besides serving as suffix-initial onsets, the following examples show that glottal stop can also serve as a lexically specified (i.e. non-epenthetic) root-internal onset.

- (19) a. kan.ʔút
'yesterday'
b. nu.ʔú
'dog'
c. ʃniʔ.ʔá
'small lizard'
d. mis.ʔá
'scarlet-headed blackbird'
e. ʔùm.ʔa.ʃí
'tomorrow'
f. kum.ʔá
'crowned eagle'
g. am.ʔá
'rat'
j. ka.jin.ʔá
'hummingbird'
- cf. f'. kum.xá
'aloja (alcoholic drink)'
cf. g'. am.pá
'nothing'

- k. $\widehat{\text{kli}}.\text{sa}.\text{ʔá}$
 ‘blue-black grassquit’
- (20) a. $\text{fak}\widehat{\text{l}}.\text{ʔú}$
 ‘brother-in-law’
- b. $\text{fak}\widehat{\text{l}}.\text{ʔá}$
 ‘nephew’
- c. $\text{fak}\widehat{\text{l}}.\text{ʔís}$
 ‘bat’
- d. $\text{uk}\widehat{\text{l}}.\text{ʔá}$
 ‘type of dove’

Albeit not exhaustive, this is a representative list of cases in which the glottal stop surfaces as a root-internal onset. A closer look reveals that these might not all be considered mono-morphemic roots; the [ʔ] might in fact be morpheme-initial, especially when considering the similarity between the kinship terms and that many forms are names of animals. Nevertheless, whether the above examples involve instances of glottal stop being parsed to root-internal onsets or not, these data clearly support the claim that glottal stops can behave as contrastive onsets in NivaꞤle. Recall, in this regard, the minimal pairs listed in (19f-f’), (19g-g’).

It is worth commenting on examples (20) where the complex segment $[\widehat{\text{kl}}]$ is parsed as a coda before a glottal stop onset. It is normally the case that the complex segment $[\widehat{\text{kl}}]$ consistently neutralizes to [k] in coda position. However, the only context in which $[\widehat{\text{kl}}]$ does not undergo this neutralization to [k] is before a tauto-morphemic glottal stop. This exceptional syllabic behavior of $[\widehat{\text{kl}}]$ will become relevant in the discussion of the feature specification of glottal stop (cf. Section 4).

3.3 Glottal stop as coda and Complex Nucleus

So far, I have presented an analysis of the Nivaêle internal syllable structure that accommodates the notions of Onset and Coda not as prime constituents, but rather as prosodic domain edges. Further, I assume an internal syllable structure that has a Nucleus as a constituent (Shaw 1992, 1994), specifically, as the Prosodic Head of the syllable. In Nivaêle, the Nucleus functions as the prosodic unit that hosts all and only the moraic units of the language.

Let us turn now to a consideration of contexts where glottal stop can be interpreted as serving as a word-medial (21) or word-final coda (22), and part of a Complex Nucleus (23).

With regards to Nivaêle syllable structure, CVC is an attested (and frequent) syllable type in the language. Moreover, it is claimed that the minimal foot in Nivaêle is CVC (Gutiérrez 2015). Let us investigate, then, the distribution of the glottal stop with respect to the final coda C in these CVC syllables. Examples in (21) show that a coda containing a glottal stop can precede both obstruents and sonorants. However, it cannot precede another glottal stop (*ʔʔ) or an ejective (ʔC'). This restriction can be interpreted as a type of Obligatory Contour Principle (OCP) effect (Odden 1986) whereby there cannot be two adjacent [c.g.] feature specifications.

(21) **Word-internal coda**

- | | | |
|----|------------|-----------|
| a. | ji-páʔ.kat | ‘my hand’ |
| b. | xi.βéʔ.kla | ‘moon’ |
| c. | βéʔ.ɬa | ‘one’ |
| d. | náʔ.ni | ‘girl’ |
| e. | xa-péʔ.j-a | ‘I hear’ |

In addition, examples of word-final glottal stops are presented in (22). Importantly, they occur after all vowel qualities.

(22) **Word-final coda**

- | | | |
|----|-----------|------------------|
| a. | t'íʔ | ‘broth’ |
| b. | méʔ | ‘otter’ |
| c. | ji-k.t'éʔ | ‘my grandmother’ |
| d. | ji.táʔ | ‘scrubland’ |
| e. | kas-kíáʔ | ‘our toy’ |
| f. | faj.xóʔ | ‘charcoal’ |
| g. | k'ak.xúʔ | ‘I greet you’ |

The examples in (21) and (22) illustrate one variant of Nivaçle phonetic glottalized vowels. Specifically, what I call *vowel-glottal coda*. In all these cases, the glottal is aligned to the right edge of the syllable domain and it is parsed directly to the syllable node, as a coda (21)-(22). However, if there is another consonant intervening between the glottal stop segment and the right edge of the syllable, the glottal stop is parsed into the Nucleus of the syllable (23). As a result, a Complex Nucleus emerges at the expense of not creating a complex coda – an illicit syllable structure in the language (23a'-23d'). This is exactly the context for the realization of another variant of Nivaçle phonetic glottalized vowels, what I call *creaky/rearticulated* vowels (23a-d)), represented variably as [V̤] and [Vʔ̤], respectively.

(23) **Creaky/rearticulated vowels**

- | | | | |
|----|-------------|---|--|
| | /kíloʔp/ | | |
| a. | [kíloʔp] | ~ | [kíloʔ ^o p] a'. *kíloʔp |
| | ‘winter’ | | |
| | /wáʔs/ | | |
| b. | [wáʔs] | ~ | [wáʔ ^a s] b'. *wáʔs |
| | ‘sky’ | | |
| | /jisaʔʃ/ | | |
| c. | [ji-sáʔʃ] | ~ | [ji.sáʔ ^a ʃ] d'. *jisaʔʃ |
| | 1.POSS-hair | | |
| | ‘my hair’ | | |

/kuʔktin/

d. [kúk.tɪn] ~ [kúʔ^uk.tɪn] e'. *kuʔktin

‘thunder’

The alternation between creaky and rearticulated vowels is, according to my fieldwork research, mostly due to speech style factors: whereas the creaky variant tokens typically occur in fast or casual speech, the rearticulated variants are typically found in careful speech tokens.⁵ Note that both the creaky [V] and the rearticulated [Vʔ^v] variants have approximately identical duration: 200 ms.

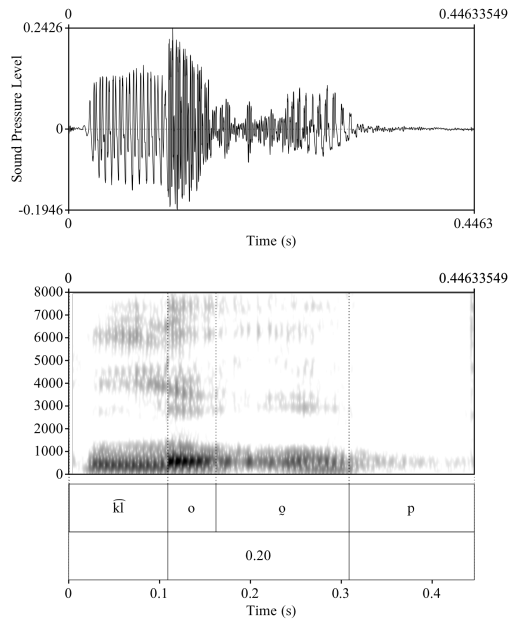


Figure 4. Waveform and spectrogram of [klóp] ‘winter’ by male speaker MV

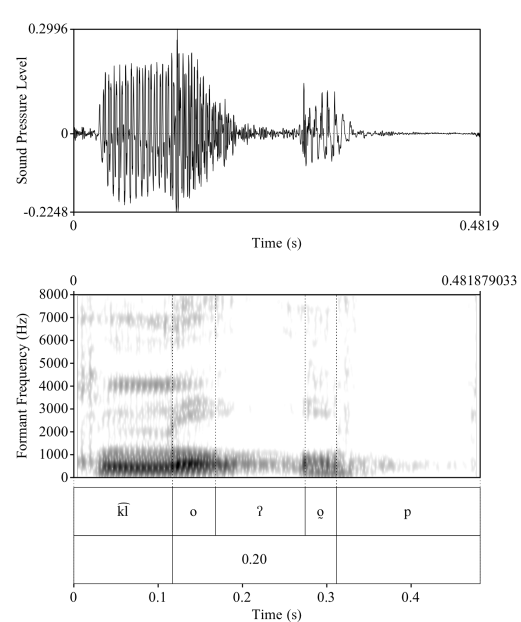


Figure 5. Waveform and spectrogram of [klóʔ^op] ‘winter’ by male speaker MV.

On the one hand, Figure 4 shows an initial period of modal phonation followed by aperiodicity. On the other hand, Figure 5 shows three different phases:

⁵ It has been noted in the literature that the implementation of glottalized vowels is subject of variation within and between speakers across languages (Avelino 2004, Gerfen & Baker 2005). For instance, gender has been noted as a factor in the realization of phonation types. Gordon and Ladefoged (2001:10) report that creaky vowels produced by San Lucas Quiavini Zapotec men sound creakier than those produced by women. Speech rate has also been correlated to variation in the implementation of phonation types (Picanço 2005:37), as is argued for Nivačle here.

modal phonation followed by a glottal closure, followed by aperiodicity in the glottal pulses, which translates into a creaky and (and lower amplitude) vowel.

Let us turn to an acoustic consideration of what are referred to as the Nivaêlé “vowel-glottal coda” cases. Recall that these are represented as [Vʔ], and occur when there is no (other) coda consonant in the syllable.

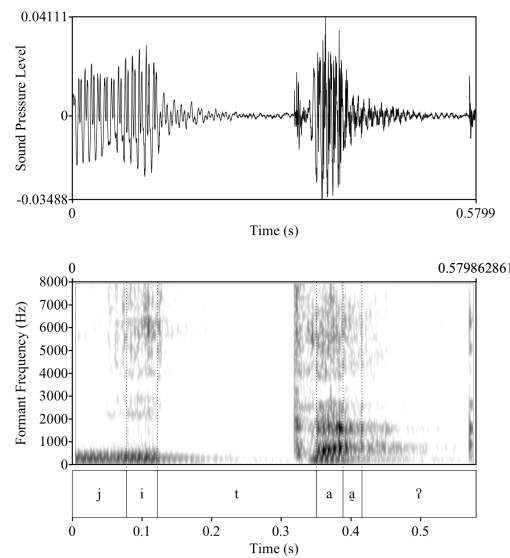


Figure 6. Waveform and spectrogram of [ji'taʔ] *scrubland* by male speaker FR

As seen in Figure 6, a vowel-glottal coda consists of a modal vowel portion followed by a full glottal closure. The last part of the vowel can be creaky due to the adjacency with the glottal stop.

To recapitulate, I analyze Nivaêlé glottalized vowels (21)-(23) as underlying sequences of /Vʔ/. Further, given that there is a consistent correlation between glottalized vowels and the locus of stress, I propose that a postvocalic glottal stop is, like vowels, underlyingly moraic. Recall that the Weight-to-Stress Principle (Prince & Smolensky 1993) states that heavy (bimoraic) syllables are required to be stressed. In other words, a postvocalic glottal stop is itself defined as a moraic root node specified for [c.g.]. This root node can attach to (i) the syllable node as coda and thus get

realized as a glottal stop (21)-(22), or (ii) to the Nucleus of the syllable and form part of a Complex Nucleus – phonetically realized as a creaky/rearticulated vowel (23).

Figure 7 summarizes the prosodic parsing of postvocalic glottal stop and the prosodic representation of Nivaêle phonetic glottalized vowels. Recall that I assume an internal syllable structure where the Nucleus is the head of the syllable and the host of the moraic units of the language (vowels and postvocalic glottal stop).

a. vowel-glottal coda	b. creaky/rearticulated vowels
<p>Diagram (a) shows a syllable structure where the Nucleus (N) contains two moras (μ). The first mora is the Root, which is a vowel (V). The second mora is a glottal stop (?). The syllable is represented as (σ)σ.</p>	<p>Diagram (b) shows a syllable structure where the Nucleus (N) contains two moras (μ). The first mora is the Root, which is a vowel (V). The second mora is a glottal stop (?). The syllable is represented as (σ)σ. The coda (C) is a creaky/rearticulated vowel.</p>
jitáʔ 'scrubland'	jisáʃ ~ jisáʔʰʃ 'my hair'

Figure 7. Prosodic representation of /Vʔ/

In Figure 7, it can be observed that: (i) moras are always parsed into the Nucleus; (ii) if the segmental content of the /ʔ/ is disassociated/delinked from its mora so that the /ʔ/ can be realized as a coda, then (in accordance with (i)) the mora remains in the Nucleus; (iii) if the full segmental content of the /ʔ/ is parsed into the Nucleus, then the surface realization is of a creaky/rearticulated vowel.

In sum, it has been shown that Nivaêle glottal stop can occur in both onset and coda position, and as part of a Complex Nucleus. Table 2 summarizes the possible syllable parsings of the glottal stop.

Table 2. Syllable types and glottal stop

Syllable types			
Open	Closed	Complex Onset	Complex Nucleus
CV	CVC	CCV(C)	CV?C
?V	CV?	CCV?	
	?VC	*C?V (C)	
	?V?	*?CV (C)	

This broad base of distribution, parallel to other major classes of consonants, motivates the representation of /ʔ/ as having an independent root node. This allows it to be parsed into not only onset, but also coda position. Importantly, a postvocalic glottal stop can be also parsed to the Nucleus of the syllable, as argued for the examples in (23).

4. Feature specification of NivaꞤle glottal stop

In light of the evidence related to the distribution of the glottal stop, I will discuss the feature representation for this segment. The first hypothesis advanced here is that the glottal stop is unspecified for place features. Three supporting arguments will be discussed:

- (i) laryngeal transparency (vowel harmony across a glottal stop)
- (ii) parsing of the glottal stop in coda position (as opposed to ejectives, which are specified for place features)
- (iii) lack of delateralization of [kɭ] before a glottal stop onset (cf. (20) above)

Laryngeal transparency has been advanced as an argument for the lack of internal place of articulation structure of laryngeals in comparison to other consonants (Section 2.3); that is, for glottal stops being placeless in non-guttural systems. In autosegmental phonology terms: due to laryngeal transparency, vocalic features can

spread across a glottal stop because no crossing of an intervening consonantal place specification is involved (Goldsmith 1976).

In NivaꞤle, spreading of vocalic features can be observed across non-epenthetic (24-26) and epenthetic glottal stops (28-29) at morpheme boundaries. Specifically, progressive vowel harmony has been attested with the imperfective /-ʔin/ and the locative /-ʔeʔ/ suffixes; as discussed in Section 3.2 these glottal initial morphemes are not epenthetic.

- (24) /...e-ʔin/
 [...e-ʔen]
- a. [nixakl̥ɛʃtʃəʔén]
 /ni = xa-k̥l̥ɛʃtʃ' e-ʔin/
 NEG = 1.S-wash-LOC-IPFV
 'I do not (habitually) do the cleaning'
- b. [xaj-kùm-ʔe-ʔén]
 /xaj-kuʔm-ʔe-ʔin/
 1.S-work-LOC-IPFV
 'I am/was working'

- (25) /...a-ʔin/
 [...a-ʔan]
 [ʔpèʔjaʔán]
 /ʔ-peʔja-ʔin/
 2.S-hear-IPFV
 'you are hearing'

- (26) /...a-ʔin/
 [...a-ʔan]
 [jifãʔjaʔán]
 /ji-faʔja-ʔin/
 3.S-fly-IPFV
 's/he is/was flying'

In (24)-(26) the high front vowel /i/ is realized harmonically as a front or back non-high non-rounded vowel across an underlying glottal stop. I have not found examples of non-low back rounded vowels triggering harmony: *[oʔon], *[uʔun]:

- (27) [xaβkúʔin] *[xaβkúʔun]
 /xa-wkuʔ-ʔin/
 1.S-swing-IPFV
 ‘I am swinging’

Vowel harmony is also attested across epenthetic glottal stops. When two vowels are adjacent in the input due to morpheme concatenation, a glottal stop is inserted and there is regressive vowel harmony: the vowel following the glottal stop spreads its place features to the preceding vowel. This vowel harmony process occurs when the trigger is a [-back, -low] vowel and the target is a [+low] vowel. Examples (28)-(29) illustrate this phenomenon:

- (28) a. [meʔéɬ]
 /ma-eɬ/
 IMP.go-EXCL.PL
 ‘go (you all)!’
 b. [meʔéj]
 /ma-ej/
 IMP.go-DIR
 ‘go (you singular) there!’
- (29) a. [xapéʔj-a] pa = ɬaβɿm
 /xapeʔj-a/ DET = wind
 1.S-hear-PUNCT
 ‘I heard the wind’
 b. [xapèʔjeʔéj]
 /xa-peʔj-a-ej/ pa = tʰáj
 1.S-hear-PUNCT-DIR DET = noise
 ‘I heard noise (from the distance)’

(30) **Progressive Vowel harmony**

(31) **Regressive vowel harmony**

23

Let us turn to a second argument for PLACE feature(s) not being part of the lexical representation of glottal stop. It has been observed that both PLACE and LARYNGEAL features are often restricted in coda position (Itô 1986, Lombardi 1995).

The lack of specification for PLACE, then, might therefore explain the asymmetric behaviour between glottal stop and ejectives in coda position. Nivaêle ejectives are banned from occurring in coda position. In descriptive terms, the generalization appears to be that when [c.g.] is functioning as a “secondary” feature (i.e. on ejective obstruents) in Nivaêle, it is not tolerated in coda position. A plain glottal stop, however, can – and quite pervasively does – occur as a coda.

It has been established, then, that the glottal stop can be parsed as a coda, in contrast with ejectives. One supporting argument for the glottal stop being parsed to coda position is word minimality: the minimal monosyllabic word in Nivaêle is CVC. Open syllable CV or CCV words are not attested: a well-formed Minimal Foot needs to be closed by a coda consonant.⁶ Given that CVC constitutes a Minimal Word in Nivaêle (see data in (33a,b) below) and given that CV? words are well-formed (see data in (33c,d) below), it follows that the glottal stop is functioning as a coda consonant (cf. also Figure 7).

- (33) a. tós
 ‘snake’

⁶ A superficially complex stress system in Nivaêle is shown to reduce to systematic regularities of three types. First, it is shown that stress is quantity-sensitive, with a consistent correlation between bimoraic weight (tautosyllabic /V?/) and stress prominence. Secondly, primary/secondary stress patterns reflect competing edge-alignment constraints where prosodic foot domains align with internal morphological category (MCat) edges. Thirdly, it is argued that a (CVC) syllable, which constitutes the Minimal Prosodic Word in Nivaêle, can function as a degenerate foot. The generalization that it only ever surfaces with secondary stress is shown to be an emergent consequence of independently motivated constraint rankings. For a more detailed account of stress patterns in Nivaêle, see Gutiérrez (2015).

- b. Ø-túx
3.S-eat
's/he eats'
- c. mé?
'otter'
- d. ł-á? d'. *łá
3.POSS-fruit
'fruit (of the tree)'

Finally, the third argument favouring the lack of oral place of articulation of the glottal stop comes from the phonotactic behaviour of /kɫ/. This complex segment only occurs before vowels and it neutralizes to [k] in final coda position (34) or word internal coda position (45), before another consonant.

- (34) a. wo.sók
 ‘butterfly’
 b. wo.so.kl̩-ís
 butterfly-PL
 ‘butterflies’
- (35) a. xa-t’ùʔ.kl̩[i].ján
 1.S-obstruct-CAUS
 ‘I obstruct’
 b. Ø-t’úk-fi
 3.S-obstruct-LOC(inside)
 ‘it is obstructed’

Nevertheless, there is one particular context in which $[\text{k}\overline{\text{l}}]$ is preserved in coda position, namely before glottal stops root internally. Compare, in this regard, (36a) with (36b), where the glottal stop onset is not part of the root.

- (36) a. uḱl.ʔá
 ‘turtle dove’
 cf.

- b. [xatpék'in]
 xa-t-pek̠-ʔin
 1.S-CISL-return-IPFV
 'I return (more than once)'

Here I argue that the fact that [k̠] can only occur as a coda before [ʔ] highlights the place-less specification of glottal stop. The fact that [k̠] does not occur before consonants (for instance, as the first member of a complex onset or in heterosyllabic consonant clusters) but before vowels – and before tautomorphemic glottal stop – suggests a relationship between glottal stop and vowel-like properties. This special behaviour of [k̠] favours a *Licensing by Cue* approach (Steriade 1997) over a prosodic approach (Lombardi 1995). It is not the case that [k̠] is banned from occurring in *coda position*, but rather that the contrastive cues for the identification of this complex segment are obscured before consonantal segments that are specified for place features.⁷

The generalizations arrived at in this section, then, form the basis for the following feature specification of the glottal stop and ejectives.

Table 3. Feature specification of glottal stop and ejectives

	ʔ	T'
PLACE		LAB/COR/DOR
CONSTRICTED GLOTTIS	✓	✓

⁷ An anonymous reviewer points out that licensing-by-cue is usually about optimizing before sonorant consonants. While I do not have conclusive evidence about the [sonorant] specification of /ʔ/, it is worth mentioning that sonority does not rise across syllable boundaries (from an obstruent to a resonant). On the one hand, the *Syllable Contact Law* is a highly ranked constraint in this language, and it would then disfavor the specification of /ʔ/ as a sonorant segment. On the other hand, the fact that /k̠/ simplifies to [k] and not [l] highlights its [-sonorant] specification. For a fuller description of this complex segment see Gutiérrez (2015).

Briefly, the data and phenomena analyzed so far are predicted by the \emptyset place specification hypothesis for /ʔ/. The phonologically active distinctive feature below the root node that function to define a glottal stop in Nivačle is [c.g.].

5. Conclusions

This paper has established the featural and prosodic representations of the glottal stop.

First, it has been proposed that the glottal stop is unspecified for place features, but specified for [c.g.]. There are three main arguments put forward in favor of this proposal: (i) laryngeal transparency (vowel harmony across a glottal stop), (ii) parsing of the glottal stop in coda position (as opposed to ejectives), and (iii) lack of delateralization of [k^hl] before a glottal stop onset.

Second, it has been shown that the distribution of the Nivacle glottal stop is not defective. On the one hand, it can be parsed to onset position, as both an epenthetic and contrastive segment. On the other hand, it can be parsed to coda position or to the Nucleus of the syllable and hence form part of a Complex Nucleus. As a result, two different manifestations of phonetic glottalized vowels are realized: *vowel-glottal coda* and *creaky/rearticulated*, respectively. These diverse glottal realizations are rooted in a set of prosodic constraints, for example, the avoidance of onsetless syllables and complex codas.

References

- Arellanes Arellanes, F. (2015). El anclaje temporal de los rasgos laríngeos en el zapoteco de San Pablo Güila y una nueva escala de laringización. In R. Gutiérrez Bravo, F. Arellanes Arellanes & M. E. Chávez Peón. *Nuevos estudios de Teoría de la Optimidad*. México: El Colegio de México.
- Avelino, H. (2004). *Topics in Yalálag Zapotec, with particular reference to its phonetic structures* (Doctoral dissertation). University of California, Los Angeles.

- Avelino, H., Coler M. & Wetzels, L. (2015) *The Phonetics and Phonology of Laryngeal Features in Native American Languages*. Leiden: Brill.
- Bennett, R. & Henderson, R. (2013). Accent in Uspanteko. *Natural Language & Linguistic Theory*, 31 (3), 589-645
- Bessell, N. & Czaykowska-Higgins, E. (1991). Interior Salish evidence for placeless laryngeals. *North East Linguistics Society*, 21, 35-49.
- Borroff, M. (2007). *A landmark underspecification account of the patterning of glottal stop* (Doctoral dissertation). Stony Brook University, Stony Brook, NY.
- Buckley, E. (1994). *Theoretical aspects of Kashaya phonology and morphology*. Stanford: CSLI Publications.
- Campbell, L. & Grondona, M. V. (2007). Internal reconstruction in Chulupí (Nivaklé). *Diachronica*, 24(1), 1-29.
- Chávez-Peón, M.E (2010) *The interaction of metrical structure, tone, and phonation types in Quiavini Zapotec* (Doctoral dissertation). University of British Columbia, Vancouver.
- Chomsky, N., & Halle, M. (1968). *The sound pattern of English*. Cambridge, MA: Massachusetts Institute of Technology Press.
- Clements, G. N. & Hume, E. (1995). The internal organization of segments. In J. Goldsmith (Ed.), *Handbook of Phonological Theory*. Cambridge, MA: Blackwell.
- DGEEC (2012). *III Censo Nacional Indígena de Población y Viviendas 2012: Pueblos indígenas del Paraguay*. Asunción: Dirección General de Estadística Encuestas y Censos. Retrieved July 15 2013 from www.dgeec.gov.py
- Demolin, D. & Storto (2012) The Phonetics and Phonology of South American Languages. In L. Campbell & V. Grondona (Eds.), *The Indigenous Languages of South America: a comprehensive guide* (331-390). Berlin: Mouton de Gruyter..
- Elías Ulloa, J. A. (2009). The distribution of laryngeal segments in Capanahua. *International Journal of American Linguistics*, 52, 159-206.
- Fabre, A. (2014). Estudio gramatical de la lengua Niva'le (Unpublished manuscript). Kangasala, Finlandia.
- Gerfen, C. (1999). *Phonology and Phonetics in Coatzacoapan Mixtec*. New York: Springer Publishing.
- Gerfen, C. & Baker, K. (2005). The production and perception of laryngealized vowels in Coatzacoapan Mixtec. *Journal of Phonetics*, 33, 311–334.
- Gerzenstein, A. (1983). *Lengua chorote. Variedad No 2*. Buenos Aires: Facultad de Filosofía y Letras, Universidad de Buenos Aires.
- Gerzenstein, A. (1994). *Lengua maká. Estudio descriptivo. Archivo de Lenguas Indoamericanas*. Buenos Aires: Facultad de Filosofía y Letras, Instituto de Lingüística, Universidad de Buenos Aires.
- Gerzenstein, A. (1999). *Diccionario Etnolingüístico Maká-Español (DELME)*. Buenos Aires: Universidad Nacional de Buenos Aires.
- Goldsmith, J. A. (1976). *Autosegmental phonology* (Doctoral dissertation). Massachusetts Institute of Technology, Cambridge, MA.
- González, H. (2014). Procesos fonológicos como rasgos areales: el caso de la palatalización en las lenguas chaqueñas. Campinas: *LIAMES*, 14, 11-40.
- Gordon, M. & Ladefoged, P. (2001). Phonation Types: A Cross-Linguistic Overview. *Journal of Phonetics*, 29(4), 383-406.

- Gutiérrez, A. (2015). Segmental and Prosodic Complexity in Nivaê: Laryngeals, Laterals, and Metathesis. (Doctoral dissertation). University of British Columbia.
- Gutiérrez, A. (2016). Patterns of (de)glottalization in Nivaê. *Proceedings of the 33rd West Coast Conference on Formal Linguistics* (pp. 176-185). Somerville, MA, USA: Cascadia Proceedings Project.
- Greenberg, J. H. (1987). Tentative Linguistic Classification of Central and South American languages. In A. Wallace (Ed.), *Men and cultures: Fifth international congress of anthropological and ethnological sciences* (pp. 791-794). Philadelphia: University of Pennsylvania Press.
- Henry, J. (1936). The linguistic position of the Ashlushlay Indians. *International Journal of American Linguistics*, 10, 86-91.
- Hume, E. & Odden D. (1996). Reconsidering [consonantal]. *Phonology*, 13(3), 345-76.
- Hunt, R. (1915). Apéndice D. Chunupí or Suhin y vocabularios castellano-inglés-chunupí-suhin. *Revista del Museo de La Plata*, 23, 257-305.
- Hyman, L. M. (1985). *A theory of phonological weight* (Vol. 19). Cinnaminson, NJ: Foris Publications.
- INDEC (2004-2005). *Encuesta Complementaria de Pueblos Indígenas*. Instituto Nacional de Estadística y Censos, Argentina. Retrieved 15 August 2012 from www.indec.mecon.ar/webcenso/ECPI/index_ecpi.asp
- Itô, J. (1986). *Syllable theory in prosodic phonology* (Doctoral dissertation). University of Massachusetts at Amherst, New York [Published by Garland, New York 1988].
- Junker, P., Wilkskamp, J. & Seelwische, J. (1968) Manual de la gramática chulupí. *Suplemento Antropológico*, 3(1-2), 159-248.
- Kaufman, T. (1990). Language History in South America: What we know and how to know more. In Payne, D. L. (Ed.). *Amazonian Linguistics* (pp. 3-74). Austin: University of Texas Press.
- Kavitskaya, D. (2002). *Compensatory lengthening: phonetics, phonology, diachrony*. Routledge, Outstanding Dissertations in Linguistics. Seoul: Hankook Publishing Co.
- Kenstowicz, M. J. & Kisseberth, C. (1979). *Generative phonology*. New York: Academic Press.
- Ladefoged, P. (1971). *Preliminaries to linguistic phonetics*. Chicago: University of Chicago Press.
- Lombardi, L. (1995). Laryngeal neutralization and syllable wellformedness. *Natural Language and Linguistic Theory*, 13, 39-74.
- Lombardi, L. (2002). Coronal epenthesis. *Phonology*, 19, 219-51.
- Macaulay, M. & Salmons, J. (1995). The Phonology of Glottalization in Mixtec. *International Journal of American Linguistics*, 61, 38-61.
- McCarthy, J. J. (1991). Semitic gutturals and distinctive feature theory. In B. Comrie & M. Eid (Eds.), *Perspectives on Arabic Linguistics III* (pp. 63-91). Amsterdam: John Benjamins Publishing.
- McCarthy, J. J. (1994). The Phonetics and Phonology of Semitic Pharyngeals. In P. Keating (Ed.), *Papers in Laboratory Phonology III: Phonological Structure and Phonetic Form* (pp. 191-233). Cambridge: Cambridge University Press.
- Najlis, E. (1984). *Fonología de la protolengua mataguaya*. *Cuadernos de Lingüística Indígena* 9. Buenos Aires: Universidad de Buenos Aires.

- Nercesian, V. (2014). *Wichi lhomtes. Estudio de la gramática y la interacción fonología-morfología-sintaxis-semántica*. Munich: Lincom.
- Odden, David (1986). On the role of the Obligatory Contour Principle in phonological theory, *Language*, 62: 353–383.
- Peterson, T. (2004). The Distribution of the Glottal Stop in Blackfoot. *Proceedings from The Workshop on American Indigenous Languages; April 30-May 2, 2004*. University of California, Santa Barbara.
- Picanço, G. (2005). *Mundurukú: Phonetics, Phonology, Synchrony, Diachrony*. (Doctoral dissertation). University of British Columbia, Vancouver.
- Prince, A. & Smolensky, P. (1993/2004). *Optimality Theory: Constraint Interaction in Generative Grammar* (2nd ed.) Malden, MA: Blackwell Publishing.
- Rose, S. (1996). Variable Laryngeals and Vowel Lowering. *Phonology*, 13(1), 73-117.
- Seelwische, J. (1990). *Diccionario nivaclé: nivaclé-castellano, castellano-nivaclé*. Mariscal Estigarribia/Asunción: Centro de Estudios Antropológicos de la Universidad Católica.
- Silverman, D. (1997). Laryngeal Complexity in Otomanguean Vowels. *Phonology*, 14(2), 235-61.
- Shaw, P. A. (1991). The laryngeal/post-velar connection (MS). Paper presented at the Conference on Phonological Feature Organization, LSA Summer Linguistic Institute, UCSC.
- Shaw, P. A. (1992). Templatic evidence for the syllable nucleus. In A. Schafer (ed.), *Proceedings of the 23rd annual meeting of the North East Linguistic Society* (pp. 463-477). Amherst, MA: Graduate Linguistic Student Association.
- Shaw, P. A. (1994). The prosodic constituency of minor syllables. In E. Duncan, D. Farka & P. Spaelti (Eds.), *The proceedings of the twelfth West Coast Conference on Formal Linguistics* (pp. 117-132). Stanford, CA: Center for the Study of Language and Information.
- Stell, N. N. (1972). *Fonología de la lengua Axluxlaj*. Buenos Aires: Universidad de Buenos Aires.
- Stell, N. N. (1989). *Gramática descriptiva de la lengua niwaklé (chulupí)* (Doctoral dissertation). Facultad de Filosofía y Letras de la Universidad de Buenos Aires, Argentina, Buenos Aires.
- Stenzel, K. (2007). Glottalization and other suprasegmental features in Wanano. *International Journal of American Linguistics*, 73, 331-66.
- Steriade, D. (1987). Locality conditions and feature geometry. In J. McDonough & B. Plunkett (Eds.), *Proceedings of North East Linguistic Society* 17 (pp. 595-617). Amherst: GLSA.
- Steriade, D. (1997). Phonetics in Phonology: The Case of Laryngeal Neutralization. Retrieved 1 May 2009 from <http://www.linguistics.ucla.edu/people/steriade/papers/phoneticsinphonology.pdf>
- Tovar, A. (1961). *Catálogo de las lenguas de América del Sur*. Buenos Aires: Editorial Sudamericana.
- Trigo, R. L. (1991). On Pharynx-Larynx Interactions. *Phonology*, 8, 113-36.
- Wicke C. & Chase-Sardi, M. (1969). Componential analysis of Chulupí (Ashlushlay) kinship terminology. *Ethnology*, 8(4), 484-93.
- Zoll, C. (1996). *Parsing Below the Segment in a Constraint Based Framework* (Doctoral dissertation). University of California, Berkeley.